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Article

Validity and Practicality of Colloid E-Learning Content Based on Individual Rotation Guided Inquiry for Senior High School

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Abstract— Blended learning is an effective learning and efficient model that can be used during an pandemic Covid-19. One of the LMS available for online learning is E-Learning. This research produced e-learning based on individual rotation guided inquiry of colloid material in the learning process. To obtain an effective product, this research is carried out starting from identification, design, development and dissemination. The research carried out with the model with research and development (R&D) method using a 4D development model. The E-learning products from this study were validated by four chemisty teachers and the analysis of validity and praticality tests was carried out by 3 teachers and 10 students in SMAN 1 Pancung Soal then analyzed using Aiken's V formula. The Aiken's V values obtained from the validity of the construct and the validity of the content are 0.88 and 0.89 with high categories. The practicality results of students and teachers were 84.38 and 87.29 with high categories respectively. Based on the results of data analysis, it can be concluded that the content of e-learning has valid and practical for use in the learning process.

Keywords— **Individual Rotation, E-Learning, Guided Inquiry, Colloid.**

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I. INTRODUCTION

The COVID-19 pandemic has affected many countries around the world, including Indonesia. The pandemic of COVID-19 has a huge impact in several fields including the field of education. The government has implemented large-scale social distancing to prevent the spread of the coronavirus so that all activities can be carried out from home until the pandemic decreases. As a result, the course of teaching and learning activities must be carried out online at home to minimize the spread of Covid-19 [1]. At this time, along with the decline in covid-19 cases, the learning process has been carried out indirectly or directly in schools (blended learning).

Blended learning is efficient and effective learning that can be used during a pandemic [2]. This model combines harmoniously based online learning and offline learning [3]. In implementation, the blended learning model

carries out the stages of learning, such as: (a) Seeking information, (b) Acquisition of infotmation and (c) Synthesis of knowledge [4]. One of the LMS that can be used as a medium in online learning is e-learning.

E-learning is a learning system that uses electronics as a learning medium [5]. E-learning is an innovation that can be used in the learning process not only to provide learning materials, but also to improve students' learning abilities in various functions [6]. Through e-learning, students can not only read the description of the material, but also see its images and animations, listen to audio to see videos related to the learning material studied [7]. Using E-learning in the learning process can improve students' knowledge and skills.

There are many models that teachers can use to apply online and face-to-face learning activities in blended learning by utilizing e-learning, one of which is individual rotation [8]. In this model, students get a schedule that has been adjusted to each individual to be able to study independently with or without the presence of a teacher. This schedule can be arranged both by the teacher and the arrangement is done by online [9, 10]. In order for student learning to be more targeted, E-learning can be arranged in accordance with the learning model in accordance with the 2013 curriculum such as discovery learning, inquiry learning, problem based learning and others.

One of the learning models recommended in the 2013 curriculum is the exploratory learning model called guided inquiry. This model is in line with the 2013 curriculum because it applies a scientific approach. One level of the inquiry model is Guided Inquiry Learning (GIL) [11]. In the GIL model, students should actively participate in the development of critical, logical, and systematic thinking skills to help students find concepts independently through questions, and thus teachers should help students learn to easily understand concepts. Therefore, GIL is one of the effective learning models that applies the learning process [12], [13].

The selection of learning models should be in accordance with the characteristics of the material being taught. Colloid matter is one of the materials that contains factual, conceptual and procedural dimensions. In addition, this material also covers macroscopic, submicroscopic and symbolic levels that are difficult for students to understand [14].

After observation, we conclude: a) Students are not used to doing online learning systems so they find it difficult, and b) the difficult part of colloid material is understanding the concepts of this material because students are already familiar with memorization systems [15].

The use of e-learning in learning can improve students' skills [9]. The Guided Inquiry Learning Model has a positive impact on critical thinking [16, 17]. In addition, the use of individual rotation has a great impact on student performance in the learning process [18]. Based on this, the author is interested in developing e-learning of colloid based on individual rotatation guided inquiry for senior high school.

II. METHODE

The type of research used in this research is development research or research and development (R&D). According to Sogiono [19], "Development research is a study used to create a particular product and test the effectiveness of a product". The development model used in this study is a 4-D model developed in 1974 by Thiagarajan, Semmel and Semmel.

Figure 1. 4D Stage Method

The Define stage is the stage to establish and define the learning requirements between the subject matter, the time of study, the location of the study. The Design Stage is the process of designing e-learning that will be developed. The Develop stage aims to produce product development through two stages, namely expert appracial, and developmental testing. The Disseminate stage is the final stage of E-learning development that is used in disseminating products developed to accepted by users [20,21].

Development research aims to produce valid and practical products. In this phase, three processes are carried out and the three phases are product validation tests, product revisions and product effectiveness tests.

The type of data obtained in this research is the main type of data, and the data comes directly from the source (Chemistry Teachers and Students). Meanwhile, the instruments used in this study were validation questionnaires and practicality questionnaires which were analyzed using the Aiken's V Formula [22].

$$V = \frac{\sum s}{n\,(c-1)}$$

$$S = r - l_o$$

l_o = lowest category of given scale
c = number of categories to choose from
r = the value provided by the validator
n = number of validators

Based on Aiken's V scale, the validity criteria can be seen in Table 1

Tabel 1. Validity based on Aiken's V scale

Aiken's V Scale	Validity Category
$V \leq 0.4$	Less
$0.4 \leq V \leq 0.8$	Medium
$0.8 < V$	Valid

III. RESULT AND DISCUSSION

The research was conducted using research and development (R&D) methods using a 4D development model consisting of definition, design, development and dissemination [23]. The resulting is in the form of "Colloid E-learning content based on individual rotation guided inquiry for senior high school" which is already valid. Validity is carried out by 4 chemistry teachers in then proceed with the product revision stage. The results of the study as a whole are:

3.1 Define Stage

In this phase, five types of analysis are carried out. The analysis carried out is:

3.1.1 Front End Analysis

The data in the analysis comes from filling out questionnaires by students and interviews with several teachers. In addition, researchers also make direct observations.

3.2.1 Students Analysis

In this analysis, the student who is subjected is the student of class XII of high school. In the student analysis, the researcher also conducted interviews with chemistry subject teachers and distributed questionnaires to students. Based on observations using questionnaires obtain that the students can already operate cellphones or laptops and also most of them have laptops and can already operate them. In addition, the facilities and infrastructure in the school are complete, such as the internet network used to access e-learning.

3.3.1 Task Analysis

In this phase is carried out by identifying basic competencies and then reduced into indicators of competency achievement in accordance with the learning objectives carried out. The basic competencies of colloids is: 3.14 Grouping the different types of colloid systems, and explaining the usefulness of colloids in life by their properties and 4.14 making food or other products that are colloid or involve colloid principles.

3.4.1 Concept Analysis

Based on the analysis of concepts can be determined the attributes of the concepts studied on colloid matter. Concept analysis is obtained a table of concept analysis. The main concepts of colloids are solutions, suspensions, lyophobic colloids and lyophile colloids.

3.5.1 Learning Objectives Formulation

Colloid learning objectives are formulated based on indicators of competency achievement that must be achieved by students.

3.2 Design Stage

The E-learning can be accessed via the link: https://elearning.zainulteam.id/. When students have accessed the link, then they can create an account and log in as shown in Figure 2.

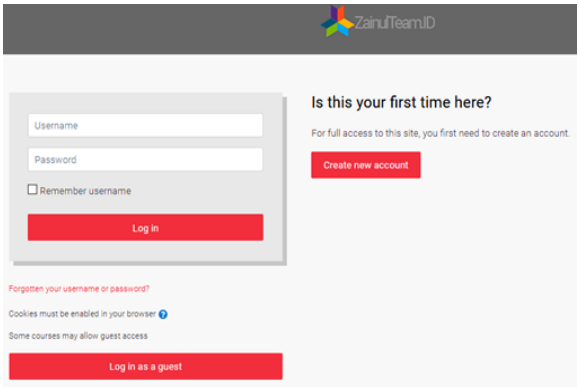

Figure 2. Login to Zainul Team E-learning

At this stage, a design e-learning of colloid will be developed. At the design stage, the following models are obtained:

Figure 3. E-Learning Display

In this colloid e-learning there are three parts of the learning step that must be passed by students. These three steps are the introduction of colloid material, colloid learning resources and colloid learning acticities. These three parts are so interconnected that the student must understand them step by step to be able to achieve the learning objectives.

The first stage is the introduction of colloidal matter, this stage is also called the orientation stage. At this stage, students can fill out the attendance list, access the syllabus, and read the introduction to colloidal material. In addition, at this stage students can also access the online learning meeting link that has been provided.

Figure 4. Introducution to Colloid Material

The second part is colloid learning resources. This section contains learning videos of colloid materials, power points, books or teaching materials and student worksheets. at this stage students can listen to learning videos and read the teaching materials given to solidify the concept. In addition, students are required to work on the worksheets provided. The student worksheets given are guided inquiry learning based. So, students can find concepts independently by answering key questions that have been given on the worksheet.

Figure 5. Learning Resources Colloid Material

The third part is colloid learning activities. In this section, students are directed to have discussions through discussion forums or chat discussion rooms on colloid material that they have studied. Then, a place is provided for students to upload worksheet work that has been done. In the final stage, students can work on the final evaluation of the colloid material to measure students' understanding of the colloidal material and this evaluation can be done twice.

Figure 6. Learning Activities Colloid Material

3.3 Develop Stage

3.3.1 Validity Test

Validation tests are carried out in the form of contract validity and content validity [24,25,26]. This validation test was carried out by 4 chemistry teachers based on expert opinions (judgment opinions) with a minimum number of 2 validators [27]. This evaluation data is processed according to the Aiken's V formula. The results of the assessment of the validity of the content can be seen in Figure 7.

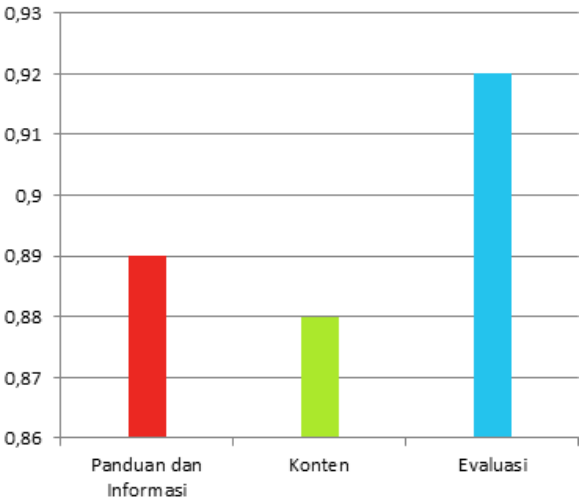

Figure 7. Graph of Contect Validity Test Result

Based on Graph 7, it can be seen that the validity value for guides and information is 0.89 has a v high category, the validity value of e-learning content/materials is 0.88 in a very high category and also the validity value of evaluation, which is 0.92 in a very high. From this it can be concluded that the validity of the e-learning content of a colloid system with a value of 0.89 belongs to a very high category. The resulting Aiken's V value shows that the e-learning developed is valid and accordance with the 2013 curriculum in the blanded learning system in the digital era 4.0.

Aspects of content feasibility can be seen from the suitability of the material or content with KD, KI and learning objectives in accordance with the abilities of the students [28,29,30]. The creation of e-learning must be arranged systematically and in accordance with applicable standards so that students can understand the material more easily [3,31,21].

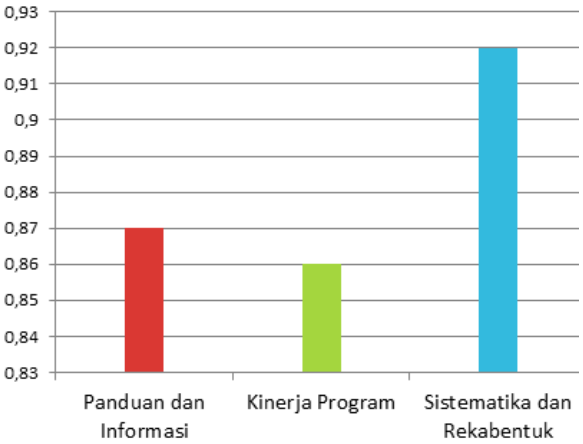

Figure 8. Graph of Construct Validity Test Result

Based on the graph, the value for the guidance and information component is 0.87 with a very high category, 0.86 for the performance of programs with high categories and 0.92 for Systematics, aesthetics and design principles in high categories. From the three results of this analysis, the construct validity value was 0.88 with a very high category. The resulting value shows that the e-learning developed is valid and in accordance with the 2013 curriculum in the blanded learning system in the digital era 4.0.

3.3.2 Practicality

The practicality of using e-learning developed can be seen from the use of the product in limited trials in the field. This test was carried out by 3 chemistry teachers and 10 students. The e-learning that is made must also have high learning flexibility (can be used repeatedly) for student

needs in the learning process [27]. The results of the practicality test can be seen in Figure 9.

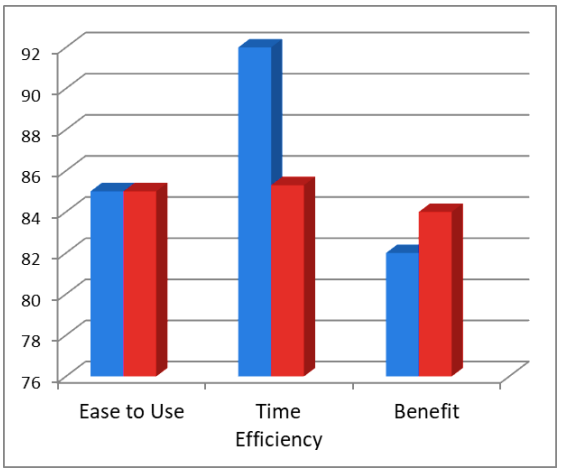

Figure 9. Diagram of Practicality test of Teacher and Students.

Based on the diagram, the results of the teacher practicality test are 87.29 with the very practical category while the practicality value of the students is 84.38 with the practical category. This shows that learning uses e-learning on colloid material that has been developed practically for use in learning.

IV. CONCLUSION

Colloid E-learning Content Based Individual Rotation Guided Inquiry for Senior High School that developed has a content validity result of 0.89 and a construct validity result of 0.88 with high respective categories. The practicality test results from teachers were 87.29 and students 84.38 with a high level of practicality category. So colloid e-learning Content based Individual Rotation Guided Inquiry for Senior High School developed is valid and practical to use in the learning process.

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